

(12) AUSTRALIAN PATENT ABSTRACT

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(54) ETHYLENE COMPOSITIONS CONTAINING TALC
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(74) WM
(57) Claim

1. Anti-blocking composition based on ethylene polymer, characterised in that it contains from 200 to 2,500 ppm of talc.

2. Anti-blocking composition according to Claim 1, characterised in that the ethylene polymer is chosen from amongst ethylene homopolymers and copolymers of ethylene with at least one co-monomer chosen from amongst carboxylic acid vinyl esters such as vinyl acetate, carbon monoxide, maleic anhydride, alkyl acrylates and methacrylates in which the alkyl group has from 1 to 6 carbon atoms, and olefines having from 3 to 8 carbon atoms.

10. Film having a thickness of between 7 and 150 μ m, characterised in that it is obtained by extrusion-blowing or co-extrusion from an anti-blocking composition according to one of Claims 1 to 9.

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COMPLETE SPECIFICATION

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Complete Specification for the invention entitled:

ANTI-BLOCKING COMPOSITIONS BASED ON POLYETHYLENE,
AND FILMS OBTAINED

The following statement is a full description of this invention, including the best method of performing it known to the inventor.

The present invention relates to anti-blocking polyethylene compositions which are useful for the manufacture of films.

Films of ethylene polymer are characterised by mediocre slip properties, which make them difficult to use in automatic conversion equipment. They are also characterised by a tendency to resist separation, due to an adhesion force, which makes them difficult to handle. The slip forces and the adhesion forces of such films, which forces are perpendicular to one another, are closely related and are the cause of numerous problems encountered in the industrial use of polyethylene films.

To improve the suitability of ethylene polymers for use, it is known to incorporate a slip agent and an anti-blocking agent therein before extrusion. Thus, British Patent No. 822,498 describes polyethylene compositions containing from 0.1 to 5 % by weight of an inert filler having a particle size of between 0.02 and 50 microns. French Patent No. 1,204,623 describes branched polyethylene compositions containing up to 0.5% by weight of a siliceous product having a particle size of less than $1\mu\text{m}$. French Patent No. 1,235,862 describes polyethylene compositions containing from 0.10 to 1.5 % by weight of silica having a particle size of between 1 and $10\mu\text{m}$.

The object of the present invention is to improve the properties, in particular the optical properties, of films manufactured from ethylene polymers, simply by

pursuing this object, talc was finally chosen as the preferred anti-blocking agent.

The present invention thus relates to compositions of ethylene polymers containing from 200 to 2,500 ppm of talc. The term "ethylene polymer" is understood as meaning either an ethylene homopolymer or a copolymer of ethylene with at least one co-monomer chosen from amongst carboxylic acid vinyl esters such as vinyl acetate, carbon monoxide, maleic anhydride, and alkyl acrylates and methacrylates in which the alkyl group has from 1 to 6 carbon atoms, these polymers being manufactured under high pressure (above 1,000 bars) in the presence of a free-radical initiator. The term "ethylene polymer" is also understood as meaning copolymers of ethylene with at least one olefine having 3 to 8 carbon atoms, these copolymers being manufactured either under high pressure (above 300 bars) and at high temperature (above 160°C), in the presence of a free-radical initiator or of a Ziegler-type catalyst system, or in solution or suspension in a hydrocarbon under moderate pressure (below 100 bars) and at moderate temperature. The ethylene polymers used within the scope of the present invention generally have a melt index of between 0.2 and 10 dg/minute and a density of between about 0.905 and 0.935 g/cm³.

The talc which may be used according to the invention is a mineral of lamellar texture, extracted from natural quarries, which is present in crystalline

It can also contain minor amounts of other metal oxides such as alumina or iron oxide. The talc used in the present invention preferably has an average particle size of between about 1 and 5 μm .

The compositions according to the invention can also optionally contain up to 1,500 ppm of a conventional slip agent such as unsaturated fatty acid amide having at least 8 carbon atoms. Examples of slip agents which may be mentioned are the amides of stearic, oleic, palmitic, erucic, myristic, behenic and lauric acids.

The compositions according to the invention show remarkable properties compared with compositions containing an equivalent amount of silica. The optical properties of films obtained from these compositions are preserved or even improved, in particular the haze. The anti-blocking properties of these films are improved, both at ambient temperature (20°C) and when hot (50°C). The compositions according to the invention therefore make it possible, for equal performance characteristics, to use a smaller amount of additive. Finally, the coefficient of friction of films obtained from these compositions is very markedly improved, both on the inner face and on the outer face, compared with the compositions containing an equivalent amount of silica.

The compositions according to the invention are normally prepared by uniformly dispersing the ingredients in the ethylene polymer, in a suitable mixer, either directly in the desired amount or via a mixture of higher concen-

films by extrusion-blowing or co-extrusion using the conventional methods. Such films generally have a thickness of between about 7 and 150 μm .

The following examples are given by way of illustration and without implying a limitation, in order to provide a better understanding of the present invention.

EXAMPLES 1 to 5

Homogeneous compositions containing 250 ppm of oleamide and, if appropriate, silica or talc are prepared in a mixer from an ethylene homopolymer having a melt index of 1.2 dg/minute, measured according to ASTM Standard Specification D 1238-73, and a density of 0.920 g/cm³, determined according to ASTM Standard Specification D 2839. The silica used in Examples 2 and 4 is an amorphous synthetic silica obtained by a wet process. The talc used in Examples 3 and 5 is a product having an average particle size of 3 μm , supplied by the Société des Talcs de Luzenac under the name talc 10 MOOS.

The various compositions are then extruded to form 30 μm thick films. The following properties are measured on these films:

- the clarity, measured according to ASTM Standard Specification D-1746 and expressed as a percentage.
- the haze, measured according to ASTM Standard Specification D-1003 and expressed as a percentage.
- the coefficient of dynamic friction measured, according to ASTM Standard Specification D-1894, on the inner face and the outer face of the

- the blocking character at ambient temperature (20°C), expressed in grams and measured according to ASTM Standard Specification D-3354.

These properties are indicated in Table I below. As will be understood, Examples 1, 2 and 4 are comparison examples.

TABLE I

| Example | Talc (ppm) | Silica (ppm) | Clarity % | Haze % | Friction | | Blocking Character (g) |
|---------|------------|--------------|-----------|--------|----------|-------|------------------------|
| | | | | | Inner | Outer | |
| 1 | 0 | 0 | 55 | 7.5 | 0.35 | 0.15 | 39 |
| 2 | 0 | 250 | 46 | 7.9 | 0.50 | 0.29 | 35 |
| 3 | 250 | 0 | 61 | 6.4 | 0.46 | 0.20 | 31 |
| 4 | 0 | 1000 | 31 | 8.9 | 0.69 | 0.63 | 29 |
| 5 | 1000 | 0 | 55 | 7.1 | 0.30 | 0.19 | 29 |

EXAMPLES 6 to 9

Homogeneous compositions containing silica or talc and, if appropriate, oleamide as a slip agent (SA) are prepared in a mixer from the ethylene polymer used in the preceding examples. The silica and the talc are those already used in the preceding examples. The various compositions are extruded to form 30 µm thick films on which the blocking character at 50°C, expressed in grams, is measured according to the method described above.

The amounts of additives used, and also the blocking character, are indicated in Table II below. As will be understood, Examples 6 and 8 are comparison

TABLE II

| Example | 6 | 7 | 8 | 9 |
|------------------------|-------|-------|-------|-------|
| SA (ppm) | 0 | 0 | 1,000 | 1,000 |
| Talc (ppm) | 0 | 1,000 | 0 | 1,000 |
| Silica (ppm) | 1,000 | 0 | 1,000 | 0 |
| Blocking character (g) | 58 | 48 | 36 | 28 |

EXAMPLE 10

A homogeneous composition containing 900 ppm of talc 10 MOOS and 400 ppm of oleamide is prepared in a mixer from an ethylene homopolymer having a melt index of 3.1 dg/minute (determined according to ASTM Standard Specification D 1238-73) and a density of 0.922 g/cm³ (determined according to ASTM Standard Specification D-2839). This composition is extruded to form a 55 μ m thick film, on which the coefficient of dynamic friction on the inner face is measured (according to ASTM Standard Specification D-1894), the clarity is measured (according to ASTM Standard Specification D-1746) and the gloss is measured (according to ASTM Standard Specification D-523). The values of these properties are as follows:

| | | |
|----------|---|------|
| Friction | : | 0.13 |
| Clarity | : | 56 % |
| Gloss | : | 98 % |

EXAMPLES 11 to 14

Homogeneous compositions containing different

are prepared in a mixer from an ethylene/but-1-ene copolymer having a melt index of 1 dg/mn (determined according to ASTM Standard Specification D 1238-73) and a density of 0.920 g/cm³ (determined according to ASTM Standard Specification D-2839). These compositions are extruded to form 25 μ m thick films, on which the coefficient of dynamic friction on the outer face is measured (according to ASTM Standard Specification D-1894) and the blocking character at 70°C is measured (according to ASTM Standard Specification D-3354). The values of these properties are indicated in Table III below. As will be understood, Example 11 is a comparison example.

TABLE III

| Example | 11 | 12 | 13 |
|------------------------|------|------|-------|
| Talc (ppm) | 0 | 500 | 2,000 |
| Blocking character (g) | 47 | 34 | 13 |
| Friction (outer) | 0.74 | 0.62 | 0.57 |

CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. Anti-blocking composition based on ethylene polymer, characterised in that it contains from 200 to 2,500 ppm of talc.
2. Anti-blocking composition according to Claim 1, characterised in that the ethylene polymer is chosen from amongst ethylene homopolymers and copolymers of ethylene with at least one co-monomer chosen from amongst carboxylic acid vinyl esters such as vinyl acetate, carbon monoxide, maleic anhydride, alkyl acrylates and methacrylates in which the alkyl group has from 1 to 6 carbon atoms, and olefines having from 3 to 8 carbon atoms.
3. Anti-blocking composition according to one of Claims 1 and 2, characterised in that the ethylene polymer has a melt index of between 0.2 and 10 dg/minute.
4. Anti-blocking composition according to one of Claims 1 to 3, characterised in that the ethylene polymer has a density of between 0.905 and 0.935 g/cm³.
5. Anti-blocking composition according to one of Claims 1 to 4, characterised in that the talc contains minor amounts of metal oxides such as alumina or iron oxide.
6. Anti-blocking composition according to one of Claims 1 to 5, characterised in that it contains from 200 to 1,000 ppm of talc.
7. Anti-blocking composition according to one of Claims 1 to 6, characterised in that the average particle

8. Anti-blocking composition according to one of Claims 1 to 7, characterised in that it also contains up to 1,500 ppm of a slip agent.
9. Anti-blocking composition according to Claim 8, characterised in that the slip agent is an unsaturated fatty acid amide having at least 8 carbon atoms.
10. Film having a thickness of between 7 and 150 μm , characterised in that it is obtained by extrusion-blowing or co-extrusion from an anti-blocking composition according to one of Claims 1 to 9.

DATED this 3rd day of March 1982.

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